JET PROPULSION LABORATORY INTEROFFICE MEMORANDUM

June 21, 2006

TO: D. Morris

FROM: A. Andujo

SUBJECT: DSS-63 Downtime Impact Study

Background

The DSS-63 Antenna in Madrid has suffered an elevation bearing failure. It has also been reported the three remaining elevation bearings are very close to failure. Several scenarios to restore the antenna to service are under consideration. This study is to assist in determining the impact of these scenarios. This study covers the maximum period of downtime under consideration, October 2, 2006 through February 3, 2008. This study is broken up into 3 periods of analysis, and skips the period in which DSS-63 is already scheduled for an approved downtime.

Summary of Results

A review of supports currently scheduled at DSS-63 from October 2, to December 31, 2006 indicates that that the following events will be impacted by a downtime:

- Cassini may lose some science data.
- Overloading of DSS-14, DSS-43, DSS-54, DSS-55 and DSS-65
- M01O, MER-A and B, MEX and MGS would be impacted by offloading from DSS-63. Combined all Mars missions rely on DSS-63 to fulfill requirements. One or more Mars missions (through MSPA) may lose science data from the loss of capability of DSS-63

In the period of January, 1 through June 10, 2007 the impact will be:

- Cassini may lose some science data.
- NHPC High requirements in support of Jupiter flyby (over Madrid) will cause extremely heavy contention at all subnets specifically 70M.
- M01O, MER-A and B, MEX and MGS would be impacted by offloading from DSS-63. Combined all Mars missions rely on DSS-63 to fulfill requirements. One or more Mars missions (through MSPA) may lose science data from the loss of capability of DSS-63
- VEX loss of MOVIE data in April 2007.

In the period of September 17, 2007 through February 3, 2008 the impact will be:

- Ulysses Nutation requires DSS-63 to fulfill requirements due to the limited viewperiod available for the mission in this period. At least one pass needs to be offloaded to DSS-63 per week on the DSS-54 maintenance day. More may be necessary due to high contention.
- M01O, MER-A and B, MEX and MGS would be impacted by offloading from DSS-63. Combined all Mars missions rely on DSS-63 to fulfill requirements. One or more Mars missions (through MSPA) may lose science data from the loss of capability of DSS-63

Major Mission Impact

The following is a list of missions that are Prime and use 70M resources in the period of October 2, 2006 – February 2, 2008:
Cassini, Dawn, Rosetta, Messenger, Mars Reconnaissance Orbiter, Venus Express, New Horizons, Spitzer, Stereo Ahead, Stereo Behind, Phoenix and SELENE.

- Cassini relies specifically on DSS-63 for certain support, but can be offloaded to other resources with some possible loss of science data.
- New Horizons Jupiter Flyby occurs over Madrid. 70M support is requested. Loss of DSS-63 may impact support.

The following lists the missions that are in Non-Prime Mission phase and use 70M resources in the period of October 2, 2006 – February 2, 2008:
ATOT, Cluster 2, Mars Express Orbiter, Mars Global Surveyor, Mars Odyssey 2001, MER-A, MER-B, SOHO, Ulysses, Voyager 1, Voyager 2 and WMAP.

- Although the above missions are in their extended phase some will have critical events that require substantial support from the DSN, but none specifically require the use of the DSS-63 antenna. That is not to say that DSS-63 is not required to fulfill all requirements.

Of the Non-Prime missions the following event should be noted:

- Ulysses will be in Nutation Season from February 2007 through February 2008
- SOHO has 5 Keyhole phases that require some 70M support, M01O and MGS both have substantial requirements in this period.
- Voyagers 1 and 2 also have requirements that require 70M support.

Analysis

October 2, 2007 – December 31, 2006

The following is a listing of users of the DSS-63 antenna and the impact to the mission by downtime in this period:

Prime Missions:

- Cassini has requested two 9-hour DSS-63 Array supports with DSS-54 as well as varied standalone support of one to three 9-hour passes in this period. Cassini may use DSS-14 for these supports as there is a viewperiod overlap of about 5 hours, but utilizing DSS-14 for a reduced period will necessitate additional uplink support from DSS-54 further adding to the offloading from DSS-63. This increases contention at DSS-14 and DS-54 substantially.
- MRO requirements may be fully supportable at other resources but at the expense of other Mars missions support.
- New Horizons requires only one 70M pass is required that can be supported at DSS-14 or DSS-43.
- Rosetta has a requirement for two DDOR Array passes at DSS-14 and DSS-63 that maybe performed at other resources.
- Spitzer requires 70M support that can offload to other resources.
- Venus Express requires 70Msupport for 26 Solar Corona passes in this period that can be supported by DSS-14 or DSS-43.

Non-Prime Missions:

- Cluster SSO support will be impacted in that the mission will not be able to achieve required simultaneous tracking support from four apertures, only three, contention permitting.
- Deep Impact requires three 8-hour passes in week 45 that can be supported at DSS-14 or DSS-43. This is a Discovery mission of opportunity. This support would validate spacecraft health.
- M01O requires specific use of DSS-63 for DDOR passes. Other use of DSS-63 by M010 is necessary to fulfill mission requirements, including Relay support for MER A and B.
- MER-A, MER-B, MEX and MGS and combinations of all Mars missions heavily rely on 70M support, eliminating support time from one mission also impacts a second and sometimes third Mars mission due to MSPA. In October and November an average of four MSPA tracks per week are planned on DSS-63. Support currently allocated at other resources may be taken by other Prime missions offloading from DSS-63.
- SOHO requires 70M support during the Keyhole that should offload to other resources.
- Voyager 1 requires DSS-63 support as a backup, primary support is performed at Goldstone antennas.

January 1, 2007 – June 10, 2007

The following is a listing of users of the DSS-63 antenna and the impact to the mission by downtime in this period:

Prime Missions:

- Cassini has requested two 9-hour DSS-63 Array supports with DSS-54 and DSS-55 as well as standalone support of fifteen 9-hour passes in this period. Cassini may use DSS-14 for these supports as there is a viewperiod overlap of about 5 hours, but utilizing DSS-14 for a reduced period will necessitate additional uplink support from DSS-54 further adding to the offloading from DSS-63. This increases contention at DSS-14 and DS-54 substantially.
- MRO requirements may be supportable at other resources but at the expense of other Mars missions support.
- New Horizons 70M requirements for 111 8-hour passes are in support of the Jupiter Approach, Flyby, Departure and Maneuvers. New Horizons Jupiter Flyby February 28, 2007 (~05:41 UTC) occurs over Madrid. 70M support is requested. Loss of DSS-63 may impact support This support could be absorbed by other resources by displacing others or reducing bit rate in this period
- Rosetta has a requirement for four DDOR Array passes with DSS-14 and five standalone Mars Swingby passes at the 70M that may be supported at other resources.
- Spitzer requires 70M support that can be supported by DSS-14 and 43.
- Venus Express requires 70M support for 5 Occultation passes in this period that can be supported by DSS-14 or DSS-43. VEX requests 5 DSS-63 passes to support the MOVIE phase in this period. DSS-14 or DSS-43 would disrupt the overlapping coverage with Cebreros antenna. No other Madrid antenna is capable of handling the data volume from this event.

Non-Prime Missions:

- Cluster SSO support will be impacted in that the mission will not be able to achieve required simultaneous tracking support from four apertures, only three, contention permitting.
- M01O requires specific use of DSS-63 for DDOR passes. Other use of DSS-63 by M010 is necessary to fulfill mission requirements, including Relay support for MER A and B.
- MER-A, MER-B, MEX and MGS and combinations of all Mars missions heavily rely on 70M support, eliminating support time from one mission also impacts a second and sometimes third Mars mission due to MSPA. Support currently allocated at other resources may be taken by other Prime missions offloading from DSS-63.
- SOHO requires 70M support during Keyhole that should offload to other resources.
- Voyager 1 requires DSS-63 support as a backup, primary support is performed at Goldstone antennas.
- WMAP requires 70M support that can be supported by DSS-14 and 43.

September 17, 2007 – February 3, 2008

The following is a listing of users of the DSS-63 antenna and the impact to the mission by downtime in this period:

Prime Missions:

- Cassini has requested four 9-hour DSS-63 Array supports with DSS-54 and DSS-55 as well as standalone support of eighteen 9-hour passes in this period. Cassini may use DSS-14 for these supports as there is a viewperiod overlap of about 5 hours, but utilizing DSS-14 for a reduced period will necessitate additional uplink support from DSS-54 further adding to the offloading from DSS-63. This increases contention at DSS-14 and DS-54 substantially.
- Messenger Deep Space Maneuver 2 requires two 8-hour 70M passes in October 2007 that may be supported at DSS-14 or DSS-43. Mercury Flyby 1 requires three days of continuous 70M support in January 2008. The use of DSS-54 may be permitted but there would be no supportability during Maintenance days,
- MRO requirements may be supportable at other resources but at the expense of other Mars missions support.
- New Horizons 70M requirements for forty-two 8-hour passes in support of the Checkout, Maneuvers and Cruise/Telemetry phases. This support should be able to be absorbed by other resources by displacing others users in this period
- Phoenix requires two 70M passes in September 2007 for ACS/NAV and TCM support that should be absorbed by DSS-14 and DSS-63.
- Spitzer requires 70M support that can be supported by DSS-14 and 43.

Non-Prime Missions:

- Cluster SSO support will be impacted in that the mission will not be able to achieve required simultaneous tracking support from four apertures, only three, contention permitting.
- M01O requires specific use of DSS-63 for DDOR passes. Other use of DSS-63 by M010 is necessary to fulfill mission requirements, including Relay support for MER A and B.
- MER-A, MER-B, MEX and MGS and combinations of all Mars missions heavily rely on 70M support, eliminating support time from one mission also impacts a second and sometimes third Mars mission due to MSPA. Support currently allocated at other resources may be taken by other Prime missions offloading from DSS-63.
- SOHO requires 70M support during Keyhole that should offload to other resources.
- Ulysses Nutation requires DSS-63 to fulfill near continuous coverage requirements due to the limited viewperiod available for the mission in this period. At least one pass needs to be offloaded to DSS-63 per week on the DSS-54 maintenance day. More may be necessary due to high contention.
- Voyager 1 requires DSS-63 support as a backup, primary support is performed at Goldstone antennas.
- WMAP requires 70M support that can be supported by DSS-14 and 43.

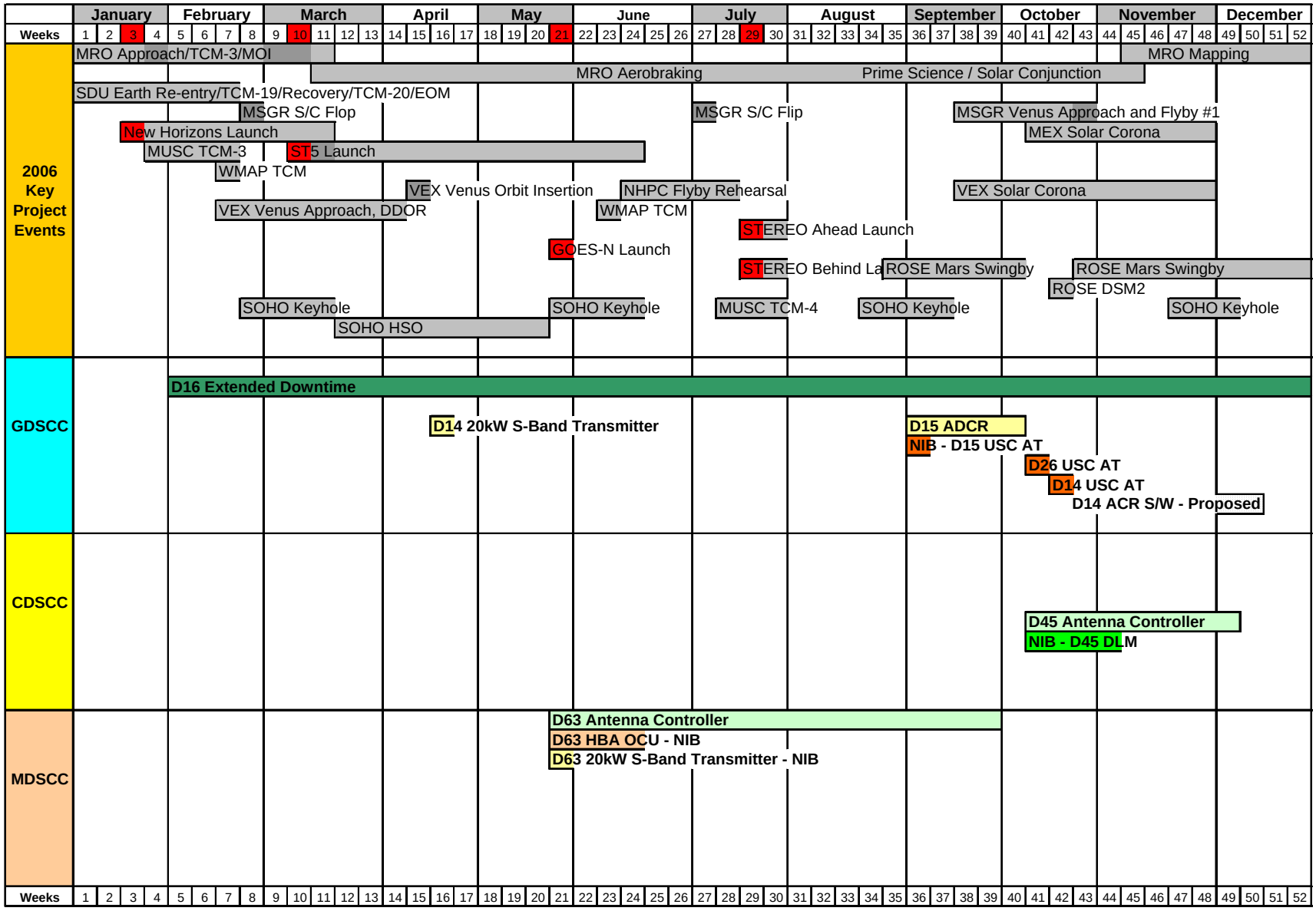
Conclusion

Based on current data gathered for this study, based on the current User Loading Profiles (ULP's) for all active missions, the DSN can provide most all of the currently requested support to Prime Missions, except when specific use of the antenna is necessary due to viewperiod, capabilities or spacecraft geometry such as Cassini, New Horizons and Venus Express.

Non-Prime missions will feel the true impact of the downtime through loss of substantial 70M time and some 34M time from offloading from DSS-63. Non-Prime missions with special or unique events will be allocated as much support as is available, but may not fulfill requirements and subsequently lose science data such as Ulysses SOHO and some Mars Missions.

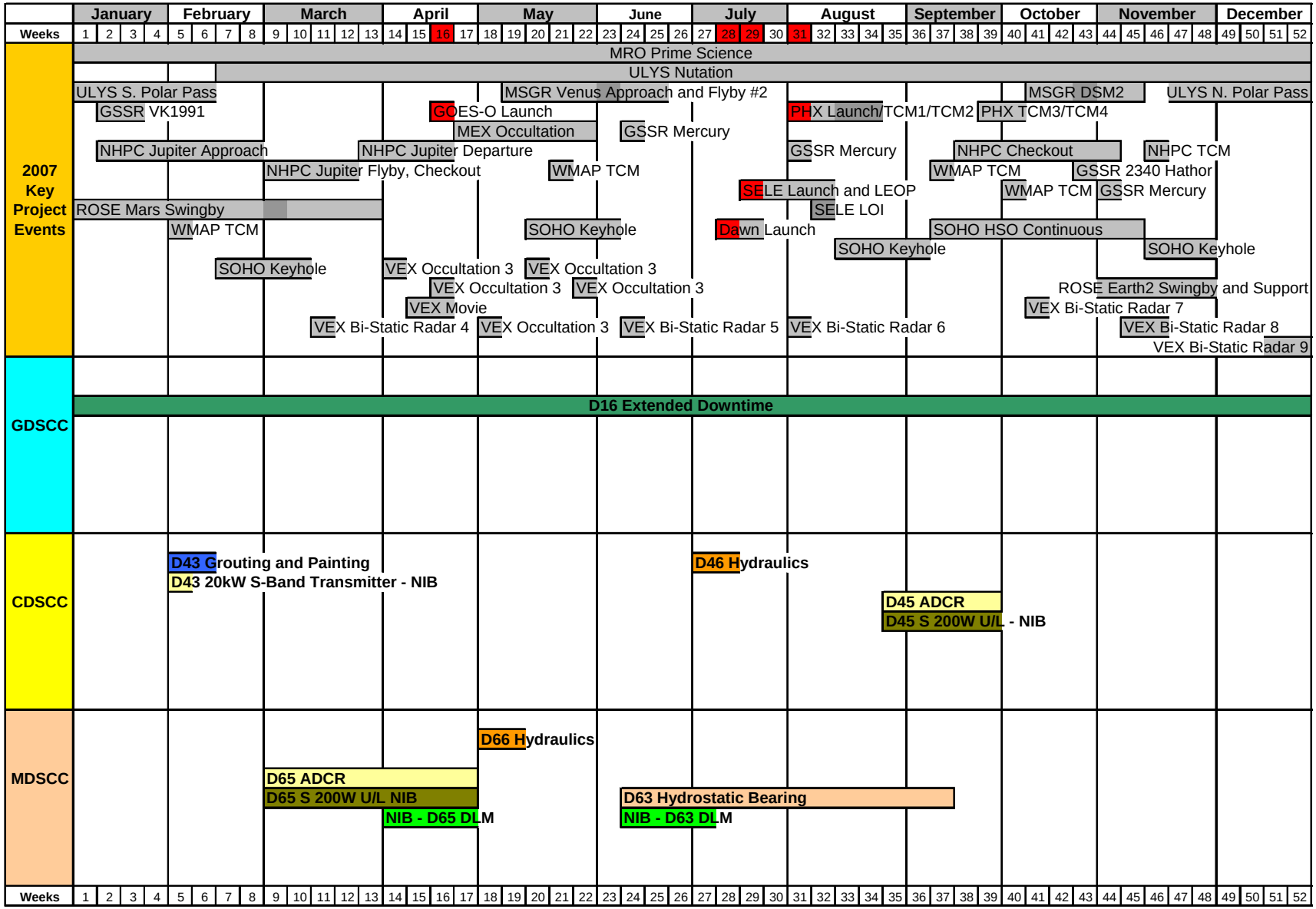
Supporting Materials

Figure 1: DSN Major Events and downtimes for 2006



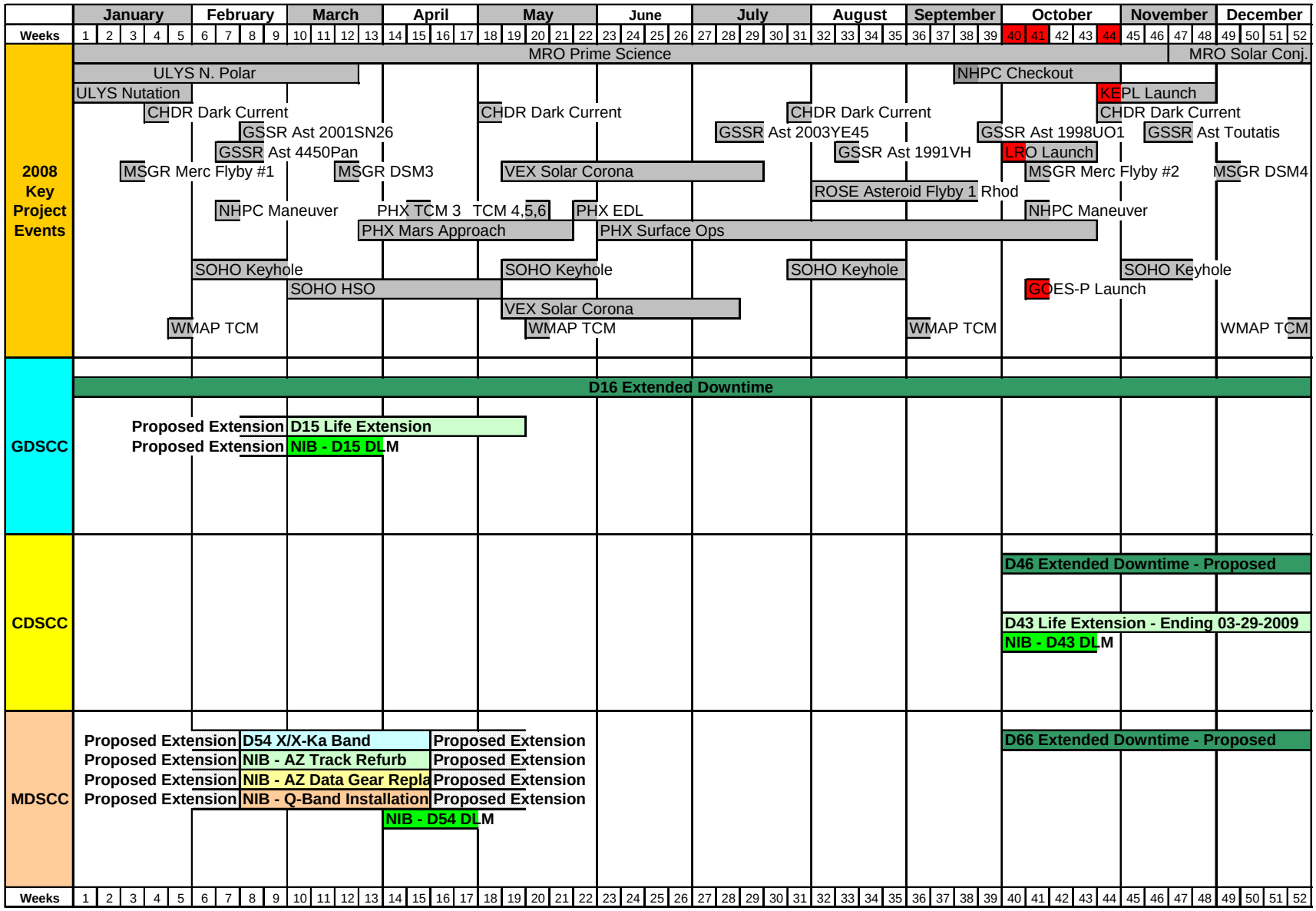
Revised: June 14, 2006

Figure 2: DSN Major Events and downtimes for 2007



Revised: May 1, 2006

Figure 3: DSN Major Events and downtimes for 2008



Revised: May 24, 2006

Figure 4: DSN DSS-63 Support Requirements for October 2, 2006 – December 31, 2006

VP			Durations		Calibration		October				November					December			
Object	User	Resource	Ave	Min	Pre	Post	40	41	42	43	44	45	46	47	48	49	50	51	52
STR6	CAS Tour	DSS-63	9.0	4.0	1.00	0.25				1		1		1	3		2		1
STR6	CAS Tour	DSS-63/54	9.0	4.0	1.00	0.25				2									
CLUC	CLU2 1/2/3/4 SSO	DSS-66/54/65/63	2.0	2.0	0.50	0.25		1		1		1		1		1		1	
DIF	DIF	70M	8.0	8.0	1.00	0.25						3							
NONE	DSN ANTCAL S/X	DSS-63	8.0	6.0	1.50	0.50			1					1				1	
DSM7	DSS Bearing Mntc	DSS-63	8.0	8.0					1			1			1			1	
DSM7	DSS Maintenance	DSS-63	8.0	6.0			1	1		1	1		1	1		1	1		1
DSM7	DSS Maintenance	DSS-63	6.0	4.0									1	1		1	1	1	1
NONE	EGS Calib	DSS-63	3.0	3.0	1.50	0.50					1								
NONE	EGS EVN J-M5	DSS-14\63	8.0	8.0	1.50	0.50					1	1	1						
NONE	EGS Global VLBI	DSS-14\63	8.0	8.0	1.50	0.50						1	1	1					
NONE	GBRA Guest OBSER	70M	4.0	4.0	0.50	0.50	2	1		2		1	1						
NONE	GBRA Guest OBSER	70M	8.0	6.0	0.50	0.50										2	1	2	1
NONE	GBRA Host Country	DSS-63	8.0	6.0				1				1		1		1			
NONE	GBRA Host Country	DSS-63	5.0	4.0							1								
NONE	GBRA Host Country	DSS-63	6.0	4.0	0.50	0.25								1					
M01O	M01O DDOR	14\63	1.0	1.0	1.50	0.25						1							
M01O	M01O Map/MEX R/S	DSS-63	9.5	4.0	2.00	0.25	3												
M01O	M01O Map/MEX R/S	DSS-63	8.0	4.0	2.00	0.25		3	3	3									
M01O	M01O Map/MGS Map	70M	10.0	4.0	2.00	0.25										7	7	7	7
`MAR6	MER1 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1
`MAR6	MER2 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1
`MAR6	MEX R/S Bi Static	70M	3.0	3.0	1.00	0.25		1		1		1		1			1		1
MEXP	MEX R/S Solar Cor	DSS-14,63	8.0	4.0	1.00	0.25	4												
MEXP	MEX R/S Solar Cor	DSS-63	6.0	4.0	1.00	0.25					3	3							
MEXP	MEX R/S/M01O Map	DSS-14,63	10.0	4.0	2.00	0.25		2	2	2	4	4	4	4	4				
MEXP	MEX R/S/MGS Map	DSS-14,63	10.0	4.0	2.00	0.25		2	2	2			3	3	3				
`MAR6	MRO Prime Science	DSS-63	7.9	4.0	1.00	0.25													1
`MAR6	MRO Prime Science	70M	8.0	4.0	1.00	0.25											3	6	3
NHPC	NHPC Maneuver	70M	8.0	4.0	1.00	0.25		1											
ROSE	ROSE Delta DOR	DSS-14\63	0.5	0.5	1.00	0.25							1			1			
SUN	SOHO Keyhole	14/27,43/46,63/66	4.0	4.0	1.00	0.25									8	7			
STF	STF	70M	1.0	1.0	0.75	0.25	14	14	14	14	14	14	14	14	14	14	14	14	14
VEX	VEX Solar Corona	70M	4.0	4.0	1.00	0.25	2	2	4	4	4	4	1	1	2	2			
VGR1	VGR1	DSS-54,55,65,63	4.0	4.0	0.50	0.25	7	7											

Figure 5: DSN DSS-63 Support Requirements for January 1, 2007 – June 10, 2007

VP			Durations		Calibration		January				February				March					April				May					June
Object	User	Resource	Ave	Min	Pre	Post	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
NONE	ATOT Development	DSS-14,63	8.0	6.0							2	2																	
NONE	ATOT Development	70M	8.0	6.0			2	2	2	2			2		1	1	2	2	2	2	2	2	2						1
NONE	ATOT Development	70M	4.0	4.0																				2	2	2	2	1	
NONE	ATOT Mission	70M	24.0	18.0	1.50	0.50																						1	
STR6	CAS Tour	DSS-63	9.0	4.0	1.00	0.25		1			1					2		1	1			1	1	2	1	1	1	1	1
STR6	CAS Tour	DSS-63/55	9.0	4.0	1.00	0.25																			1				
STR6	CAS Tour	DSS-63/54	9.0	4.0	1.00	0.25																						1	
CLUC	CLU2 1/2/3/4 SSO	DSS-66/54/65/63	2.0	2.0	0.50	0.25	1		1		1		1																
CLUC	CLU2 1/2/3/4 SSO	DSS-66/54/63	2.0	2.0	0.50	0.25											1		1		1		1						
CLUC	CLU2 1/2/3/4 SSO	DSS-66/65/63	2.0	2.0	0.50	0.25																			1		1		1
NONE	DSN ANTCAL S/X	DSS-63	8.0	6.0	1.50	0.50			1					1				1				1				1			
DSM7	DSS Bearing Mntc	DSS-63	8.0	8.0				1			1			1			1			1			1			1			1
DSM7	DSS Maintenance	DSS-63	6.0	4.0			1	1	1	1	1	1	1	1	2						1	1		1	1	1	1	1	1
DSM7	DSS Maintenance	DSS-63	8.0	8.0			1		1	1		1	1			1		1	1	1			1	1	1		1	1	
NONE	EGS EVN J-M5	DSS-14\63	24.0	18.0	1.50	0.50								1	1													1	1
NONE	GBRA Guest OBSER	DSS-14,63	8.0	6.0	0.75	0.50						2																	
NONE	GBRA Guest OBSER	70M	8.0	6.0	0.75	0.50	1	2	1	2	1		1	1	1	2	1	2	1	2	2	2	1		1				1
NONE	GBRA Guest OBSER	70M	4.0	4.0	0.75	0.50																		1		1	1	1	
NONE	GBRA Host Country	DSS-63	8.0	6.0							1				1				1				1					1	
NONE	M01O DDOR	14\63	1.0	1.0	1.50	0.25				1				1															
M01O	M01O DDOR	14\63	1.0	1.0	1.50	0.25												1				1				1			
M01O	M01O Map/MGS Map	DSS-63	9.3	4.0	1.00	0.25														2	3								
M01O	M01O Map/MGS Map	70M	10.0	4.0	1.00	0.25																		3	2	2	3	2	4
M01O	M01O Map/MRO PrSci	DSS-63	8.0	4.0	1.00	0.25									1														
M01O	M01O Map/MRO PrSci	DSS-14,63	8.0	4.0	1.00	0.25												2	2	2	2								
M01O	M01O Map/MRO PrSci	70M	8.0	4.0	1.00	0.25										2	2							2	2				3
M01O	M01O Mapping	DSS-63	9.5	4.0	1.00	0.25																3							
M01O	M01O Mapping	70M	6.0	4.0	1.00	0.25											2												
M01O	M01O Mapping	70M	10.0	4.0	1.00	0.25																		1	2	2	1	2	
6-Mar	MER1 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6-Mar	MER2 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
M01O	MEX Occ/M01O Map	DSS-15,63	11.0	4.0	1.00	0.25																	4						
M01O	MEX Occ/M01O Map	70M	10.0	4.0	1.00	0.25																		3	3				
M01O	MEX Occ/M01O Map	70M	11.0	4.0	1.00	0.25																				3	3	3	3
6-Mar	MEX R/S Bi Static	70M	3.0	3.0	1.00	0.25		1		1		1		1		1		1		1		1		1		1		1	
6-Mar	MRO Prime Science	DSS-63	7.5	4.0	1.00	0.25	2	2	2	2																			
6-Mar	MRO Prime Science	DSS-14,63	8.0	4.0	1.00	0.25					6							6	6	2	2								
6-Mar	MRO Prime Science	DSS-63	8.0	4.0	1.00	0.25														4	4								
6-Mar	MRO Prime Science	70M	8.0	4.0	1.00	0.25						6										3	3	1	1	3	3	3	
6-Mar	MRO PSci/M01O Map	DSS-14,63	8.0	4.0	1.00	0.25										10	10												
6-Mar	MRO PSci/M01O Map	70M	8.0	4.0	1.00	0.25							10	10															
M01O	MRO PSci/M01OMap	DSS-63	7.5	4.0	1.00	0.25	1	1	1	1																			
NHPC	NHPC Jupiter Aprch	DSS-14,63	8.0	4.0	1.00	0.25							7																
NHPC	NHPC Jupiter Aprch	70M	8.0	4.0	1.00	0.25	5	5	5	5	7	7																	
NHPC	NHPC Jupiter Dpart	DSS-14,63	8.0	4.0	1.00	0.25												2											
NHPC	NHPC Jupiter Dpart	70M	8.0	4.0	1.00	0.25													4	3	3	4	6	3	3	3	3	3	3
NHPC	NHPC Jupiter Flyby	70M	8.0	4.0	1.00	0.25								11	16														
NHPC	NHPC Maneuver	DSS-14,63	8.0	4.0	1.00	0.25						1																	
NHPC	NHPC Maneuver	70M	8.0	4.0	1.00	0.25											1						1						
NONE	RFC CAT S/X	DSS-15\45,15\63	24.0	24.0	1.50	0.50												1	1										
NONE	RFC CLK SYN	DSS-15\63	4.0	4.0	1.50	0.50									1		1		1		1		1						
ROSE	ROSE Delta DOR	DSS-14\63	1.0	0.5	1.00	0.25								2															
ROSE	ROSE Delta DOR	DSS-15\63	0.9	0.5	1.00	0.25								2															
ROSE	ROSE Mars Swingby	70M	4.0	4.0	1.00	0.25							3	2															
SUN	SOHO Keyhole	14/27,43/46,63/66	4.0	4.0	1.00	0.25								4	4	5											12	12	
SUN	SOHO Keyhole	15/27,45/46,63/66	4.0	4.0	1.00	0.25									4	1													
STF	STF	70M	1.0	1.0	1.00	0.25	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
VEX	VEX Movie(70M)	DSS-63	8.0	8.0	1.00	0.25															4	1							
VEX	VEX Occultation3	70M	2.0	1.0	1.00	0.25														1		1		1		1		1	
MAP	WMAP.	70M	0.7	0.6	1.25	0.25	7	7	7	7	4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	4	7	7

Figure 6: DSN DSS-63 Support Requirements for September 17, 2007 – December 30, 2007

VP			Durations		Calibration		Septemb		October				November					December			
Object	User	Resource	Ave	Min	Pre	Post	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
NONE	ATOT Development	70M	8.0	6.0			2	2	2	2	2	2	1	2	2	2	1	1	2	2	2
STR6	CAS Tour	DSS-63	9.0	4.0	1.00	0.25	1	1				4		1	1		1	6	1	2	
STR6	CAS Tour	DSS-63/54	9.0	4.0	1.00	0.25		1								1				1	
STR6	CAS Tour	DSS-63/65	9.0	4.0	1.00	0.25			1												
CLUC	CLU2 1/2/3/4 SSO	DSS-66/54/65/63	2.0	2.0	0.50	0.25		1		1		1		1		1		1		1	
NONE	DSN ANTCAL S/X	DSS-63	8.0	6.0	1.50	0.50	1				1					1				1	
NONE	DSN ZDD Cal.	DSS-63	8.0	8.0								1									
NONE	DSN ZDD Cal.	DSS-63	4.0	4.0								1									
DSM7	DSS Bearing Mntc	DSS-63	8.0	8.0			1			1			1			1			1		
DSM7	DSS Maintenance	DSS-63	6.0	4.0			1	1	1	1	1		1	1	1	1	1	1	1	1	1
DSM7	DSS Maintenance	DSS-63	8.0	8.0				1	1		1			1	1		1	1		1	1
DSN3	DSS Maintenance	DSS-63	8.0	8.0								1									
DSN2	DSS Maintenance	DSS-63	6.0	4.0								1									
NONE	EGS EVN J-M5	DSS-14\63	24.0	18.0	1.50	0.50						1	1								
NONE	GBRA Guest OBSER	70M	8.0	6.0	0.75	0.50	1	2	1	2	2	1	1	2	2	1	1				
NONE	GBRA Host Country	DSS-63	8.0	6.0					1				1				1			1	
M01O	M01O DDOR	14\63	1.0	1.0	1.50	0.25					1				1				1		
M01O	M01O Map/MGS Map	70M	10.0	4.0	1.00	0.25			6												
M01O	M01O Map/MRO PrSci	70M	10.0	4.0	1.00	0.25	7	7													
M01O	M01O Map/MRO PrSci	70M	8.0	4.0	1.00	0.25							7	7	7	7	7				
M01O	M01O Mapping	70M	10.0	4.0	1.00	0.25			1	7	7	7						7	7	7	7
M01O	M01O Themis	70M	10.0	4.0	1.00	0.25											7	7	7	7	7
`MAR6	MER1 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
`MAR6	MER2 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
`MAR6	MEX R/S Bi Static	70M	3.0	3.0	1.00	0.25	1		1		1		1		1		1		1		1
`MAR6	MRO PrSci/MEXOS	70M	8.0	4.0	1.00	0.25			7												
MSGR	MSGR DSM-2	70M	8.0	7.0	1.00	0.25						2									
NHPC	NHPC Checkout	70M	8.0	4.0	1.00	0.25	3	2	3	2	3	2		1							
NHPC	NHPC Checkout	DSS-43,63	8.0	4.0	1.00	0.25							2								
NHPC	NHPC Cruise/Teleme	70M	8.0	4.0	1.00	0.25								1	1	1	1	1		1	1
NHPC	NHPC Maneuver	70M	8.0	4.0	1.00	0.25													7		
PHX	PHX ACS/NAV	70M	8.0	4.0	1.00	0.25															
PHX	PHX TCM	70M	8.0	4.0	1.00	0.25			1												
SUN	SOHO Keyhole	14/27,43/46,63/66	4.0	4.0	1.00	0.25										8	7				
STF	STF	70M	1.0	1.0	1.00	0.25	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
ULYS	ULYS Nutation	DSS-14,43,63,34B1	8.0	5.0	1.00	0.25															
ULYS	ULYS Nutation	DSS-14,24,54,63	8.0	5.0	1.00	0.25	15	15	15	15	14	14	14	14	14	14	14				
ULYS	ULYS Nutation	DSS-14,24,54,63	6.0	6.0	1.00	0.25												21	21	21	21
MAP	WMAP.	70M	0.7	0.6	1.25	0.25	7	7	4	7	7	7	7	7	7	7	7	7	7	7	7

Figure 7: DSN DSS-63 Support Requirements for December 31, 2007 – February 3, 2008

VP			Durations		Calibration		January				
Object	User	Resource	Ave	Min	Pre	Post	1	2	3	4	5
CLUC	CLU2 1/2/3/4 SSO	DSS-66/54/65/63	2.0	2.0	0.50	0.25	1		1		1
NONE	DSN ANTCAL S/X	DSS-63	8.0	6.0	1.50	0.50			1		
DSM7	DSS Bearing Mntc	DSS-63	8.0	8.0			1			1	
DSM7	DSS Maintenance	DSS-63	6.0	4.0			1	1	1	1	1
DSM7	DSS Maintenance	DSS-63	8.0	8.0				1	1		1
NONE	GBRA Guest OBSER	70M	8.0	6.0	0.75	0.50	1	2	1	2	1
NONE	GBRA Host Country	DSS-63	8.0	6.0							1
M01O	M01O DDOR	14\63	1.0	1.0	1.50	0.25			1		
M01O	M01O Map/MGS Map	70M	10.0	4.0	1.00	0.25	7	7	7	7	7
M01O	M01O Themis	70M	10.0	4.0	1.00	0.25	7	7	7	7	7
`MAR6	MER1 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1		1	1
`MAR6	MER2 D/L MSPA	70M	2.0	2.0	1.50	0.25	1	1	1	1	1
`MAR6	MEX R/S Bi Static	70M	3.0	3.0	2.00	1.00		1		1	
`MAR6	MRO Prime Science	70M	8.0	4.0	1.00	0.25	7	7	7	7	7
MSGR	MSGR Mercury FB1	70M	8.0	7.0	1.00	0.25			8	1	
NHPC	NHPC Cruise/Teleme	70M	8.0	4.0	1.00	0.25	1			1	1
NHPC	NHPC Maneuver	70M	8.0	4.0	1.00	0.25		3	4		
STF	STF	70M	1.0	1.0	0.75	0.25	14	14	14	14	14
ULYS	ULYS Nutation	DSS-14,24,54,63	10.0	5.5	1.00	0.25	14	2			
ULYS	ULYS Nutation	DSS-14,24,54,63	12.0	6.0	1.00	0.25		5	14	14	14